

Communicating Air Quality & Health Information

Monitoring, AQI, Standards & Notification
The South Coast Perspective

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Sacramento, April 29-30, 2004

Standards and Episodes

- Standards and episodes govern the issuance of cautionary health statements
- Federal and State set air quality standards
- Cautionary health messages are issued when the air quality standards are or are forecasted to be exceeded using the Air Quality Index
- States are required by the CAA to adopt episode warnings for the public awareness

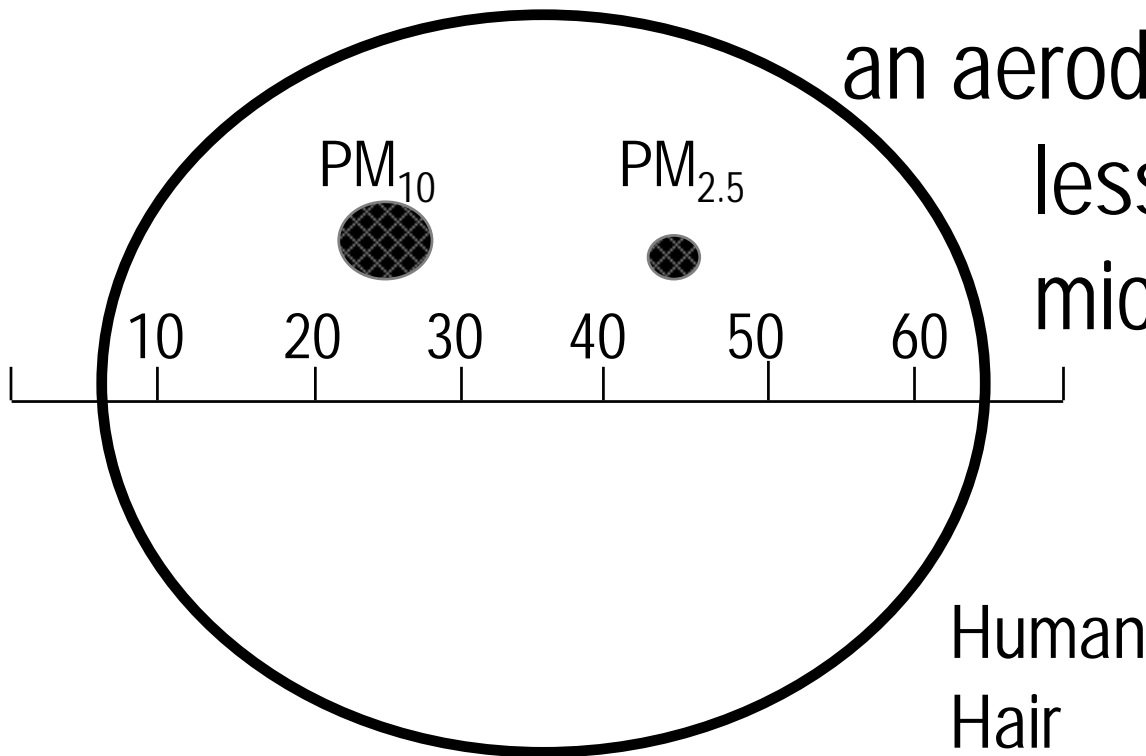
Federal Attainment Status of the South Coast Air Basin

- Ozone ☐
- PM10 / PM2.5 ☐
- Carbon Monoxide* ☒
- Nitrogen Dioxide ☒
- Sulfur Dioxide ☒
- Lead ☒

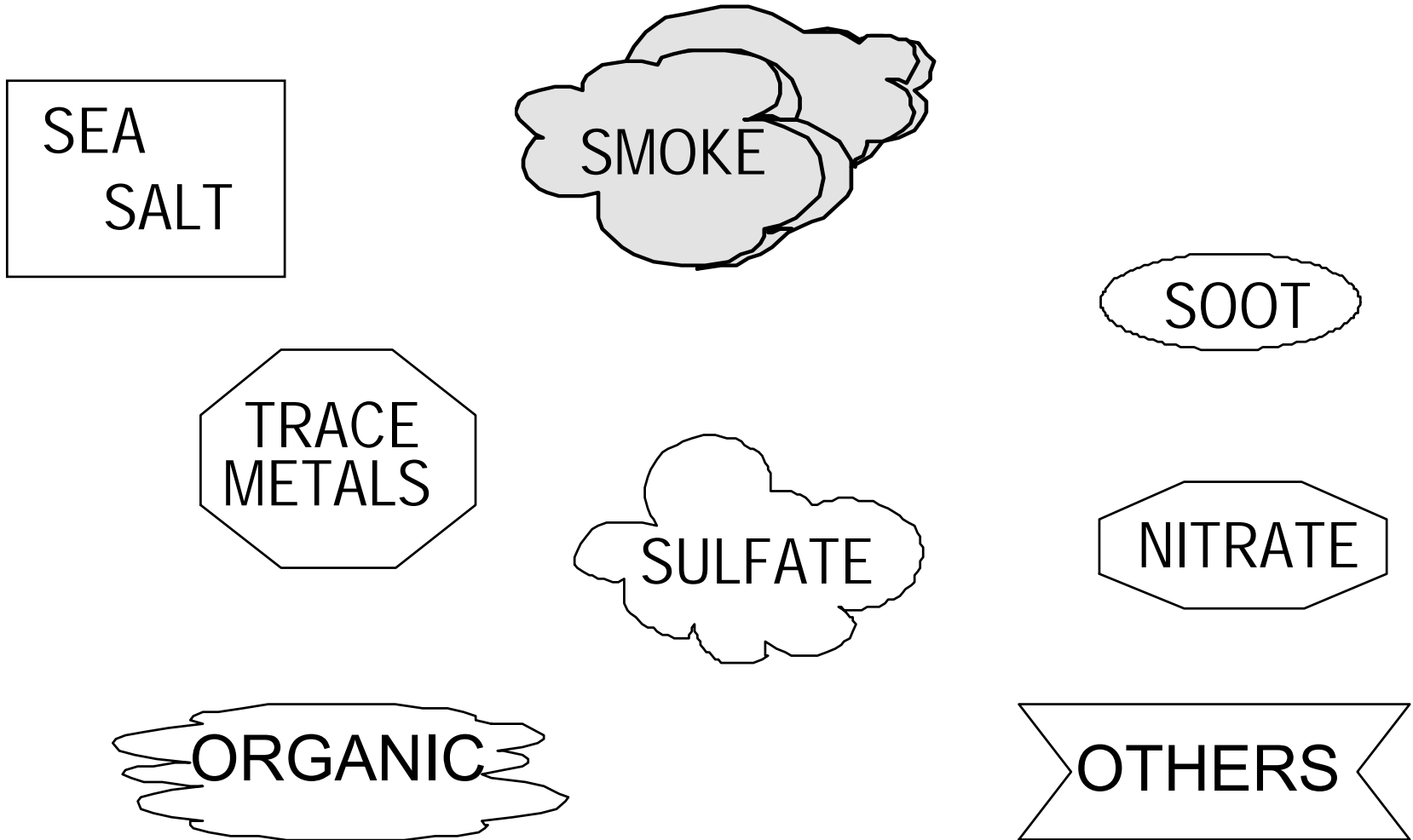
* Technically in attainment for CO, but not yet redesignated.

What is PM_{10} and $PM_{2.5}$

Particulate Matter with
an aerodynamic diameter
less than 10 or 2.5
microns, respectively



What is Particulate Matter (PM)?



Sources of PM

- PM₁₀
 - Road Dust
 - Grinding
 - Agricultural
 - Construction
 - PM_{2.5} Sources
 - Natural

- PM_{2.5}
 - Power Plants
 - Industrial Processes
 - Livestock
 - Natural
 - Motor Vehicles

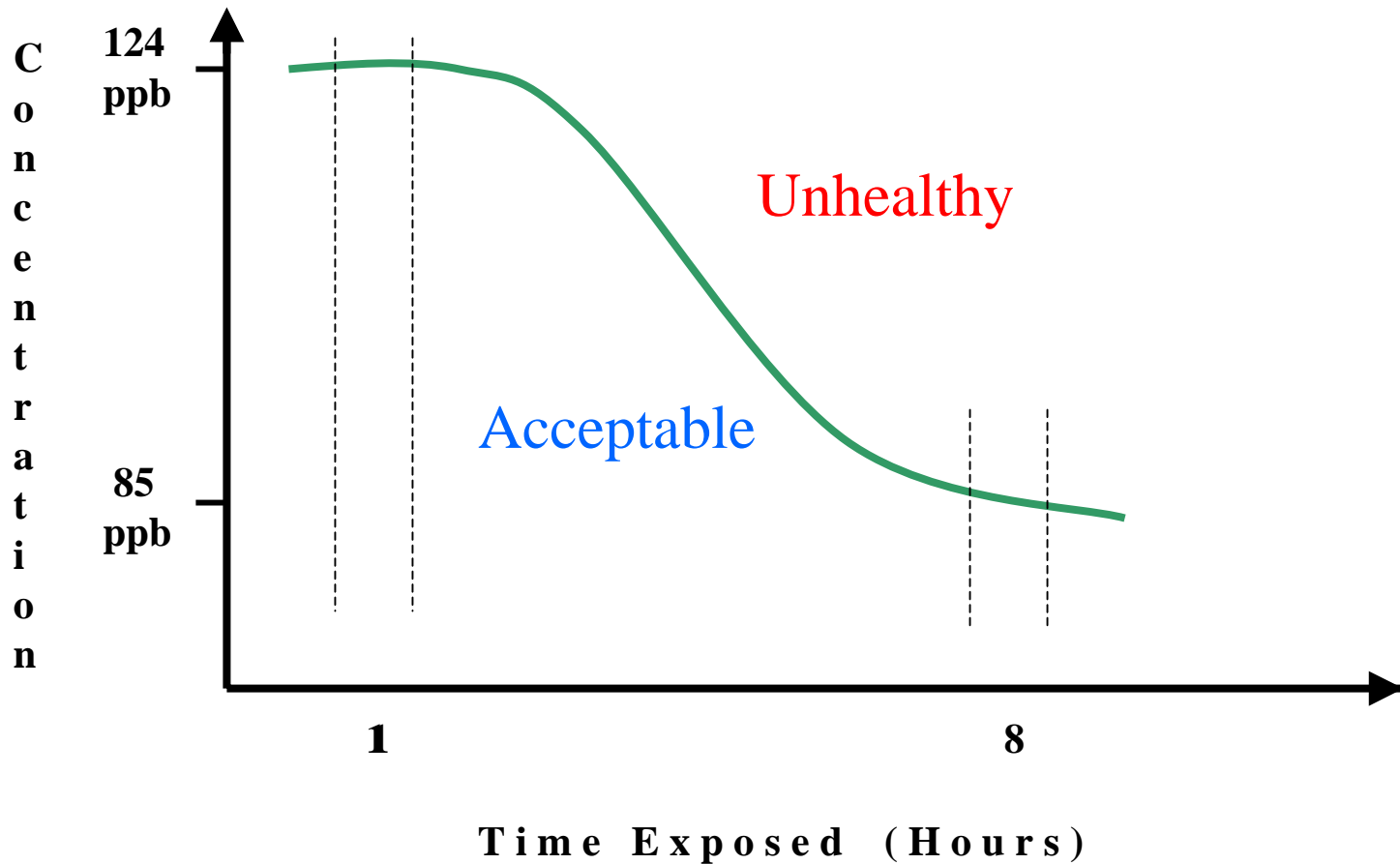
Air Quality Standards

- Ozone
 - Federal 1-Hour 124 ppb
 - Federal 8-Hour 80 ppb
 - California 1-Hour 90 ppb
- PM_{2.5}
 - Federal 24-Hour 65 $\mu\text{g}/\text{m}^3$
- PM₁₀
 - Federal 24-Hour 150 $\mu\text{g}/\text{m}^3$
 - California 24- Hour 50 $\mu\text{g}/\text{m}^3$

Implementation Of 8-Hour Ozone Standard

- 8-Hour standard more protective
- Health studies confirmed longer exposure (2-6 hours) at lower concentrations have similar impacts as acute 1-hour impact
- Health messages for 8-hour standard are incorporated in the Air Quality Index (AQI)
- 1-Hour standard will be phased out in June 2005
- Uniform increase in number of days exceeding the standard

Ozone Dose – Response Curve



2003 Ozone Air Quality Comparison

Location	Days Exceeding 1-Hour Standard	Days Exceeding 8-Hour Standard	1-Hour Peak (ppm)	8-Hour Peak (ppm)
Basin	68	119	0.216	0.198
San Joaquin	37	130	0.151	0.130
Houston	33	45	0.229	0.141
Europe	--	--	0.213	--

Air Quality Index (AQI)

- Non-dimensional method to communicate air quality levels and health risk
- Applicable for multiple pollutants and simplifies public outreach
- Separates air quality into 5-categories
 - Good
 - Moderate
 - Unhealthy for sensitive groups
 - Unhealthy
 - Very Unhealthy

Air Quality Index

(continued)

- Replaced Pollutant Standard Index (PSI)
- Designed for 8-hour average ozone and 24-hour PM_{2.5} exposure
- More health descriptor categories than PSI
“unhealthy for sensitive groups”
- Highest AQI for either 1- or 8-hours average ozone is representative
- Consistent with California’s episode criteria

AQI Index Values	Levels of Health Concern	Cautionary Statements Ozone	Cautionary Statements PM2.5
0-50	Good	None	None
51-100*	Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
101-150	Unhealthy for Sensitive Groups	Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.
151-200	Unhealthy	Active children and adults, and people with lung disease, such as asthma, should avoid prolonged or heavy exertion outdoors. Everyone else, especially children, should reduce prolonged or heavy exertion outdoors.	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.

California's Episode Criteria

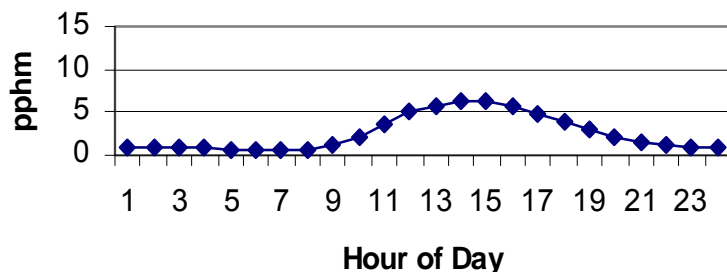
- Based on 1-hour “acute” exposure
- Designed to prevent significant harm to the public
- 3-Tiered Approach
 - Stage -1 (0.20 ppm)
 - Stage -2 (0.35 ppm)
 - Stage -3 (0.50 ppm)
- Ozone Health Advisory (0.15 ppm)
 - Designed to protect healthy individuals
 - Targets school children and activities

Translating Episodes to AQI

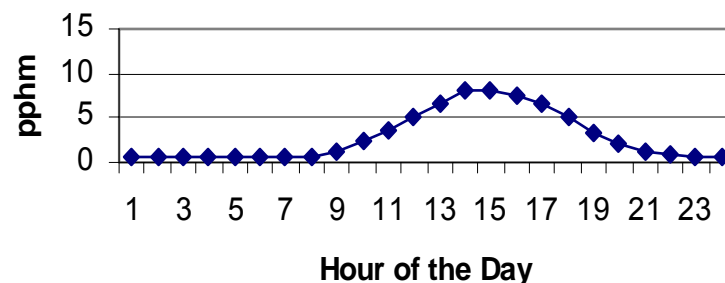
- Air pollution transport impacts the translation of the 1-hour average episode criteria into the 8-hour average AQI
- Areas impacted by short term exposure have a lower corresponding AQI
- California Health Advisory:
1-hr 0.15 ppm \approx 8-hrs 0.104 - 0.122 ppm
- Stage 1 Episode:
1-hr 0.20 ppm \approx 8-hrs 0.129 - 0.156 ppm

Transport and Timing of Peaks

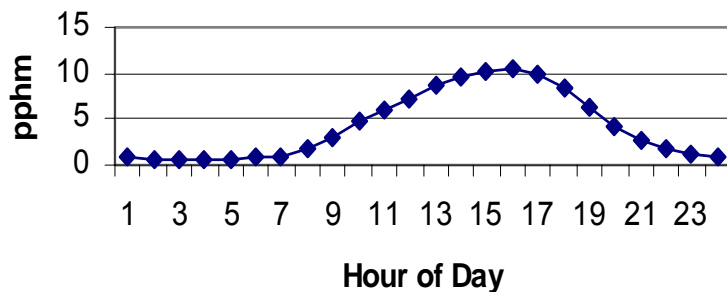
Los Angeles Summer Ozone



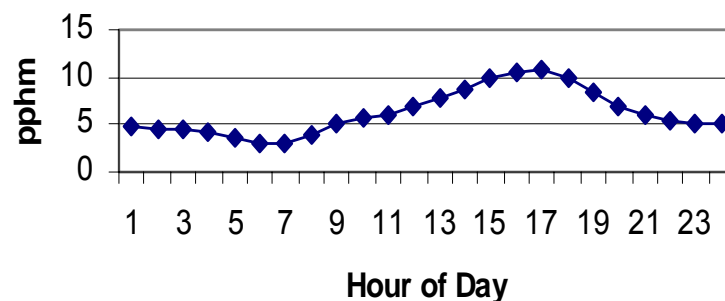
Pomona Summer Ozone



San Bernardino Summer Ozone



Crestline Summer Ozone



Transport Impacts to Ozone Averaging

- 8-hour ozone (0.124 ppm)

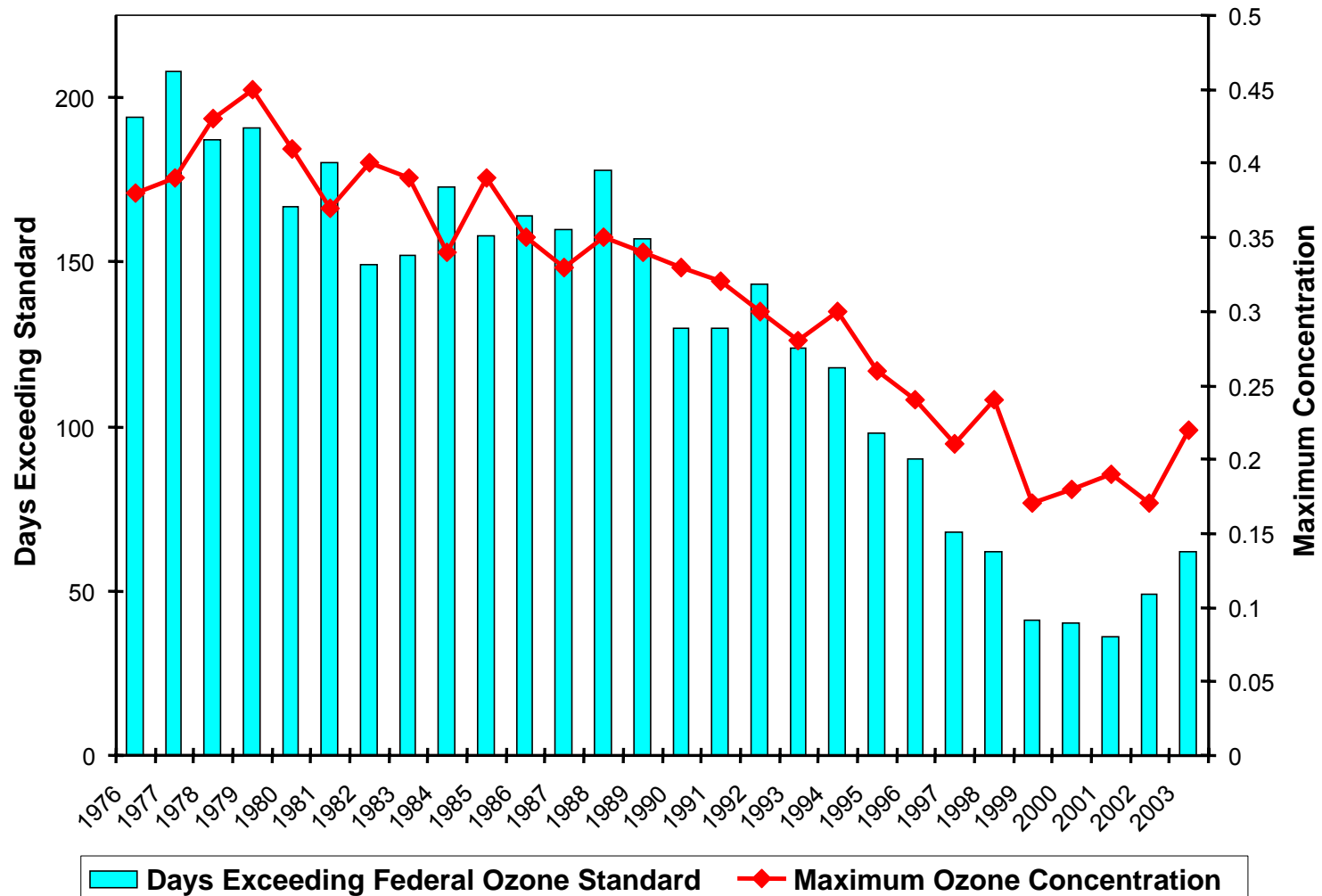
Los Angeles	= 0.18 ppm 1-hour
Pomona	= 0.17 ppm 1-hour
San Bernardino	= 0.16 ppm 1-hour
Crestline	= 0.15 ppm 1-hour
- 1-hour ozone (0.15 ppm)

Los Angeles	= 0.104 ppm 8-hours
Pomona	= 0.106 ppm 8-hours
San Bernardino	= 0.119 ppm 8-hours
Crestline	= 0.122 ppm 8-hours

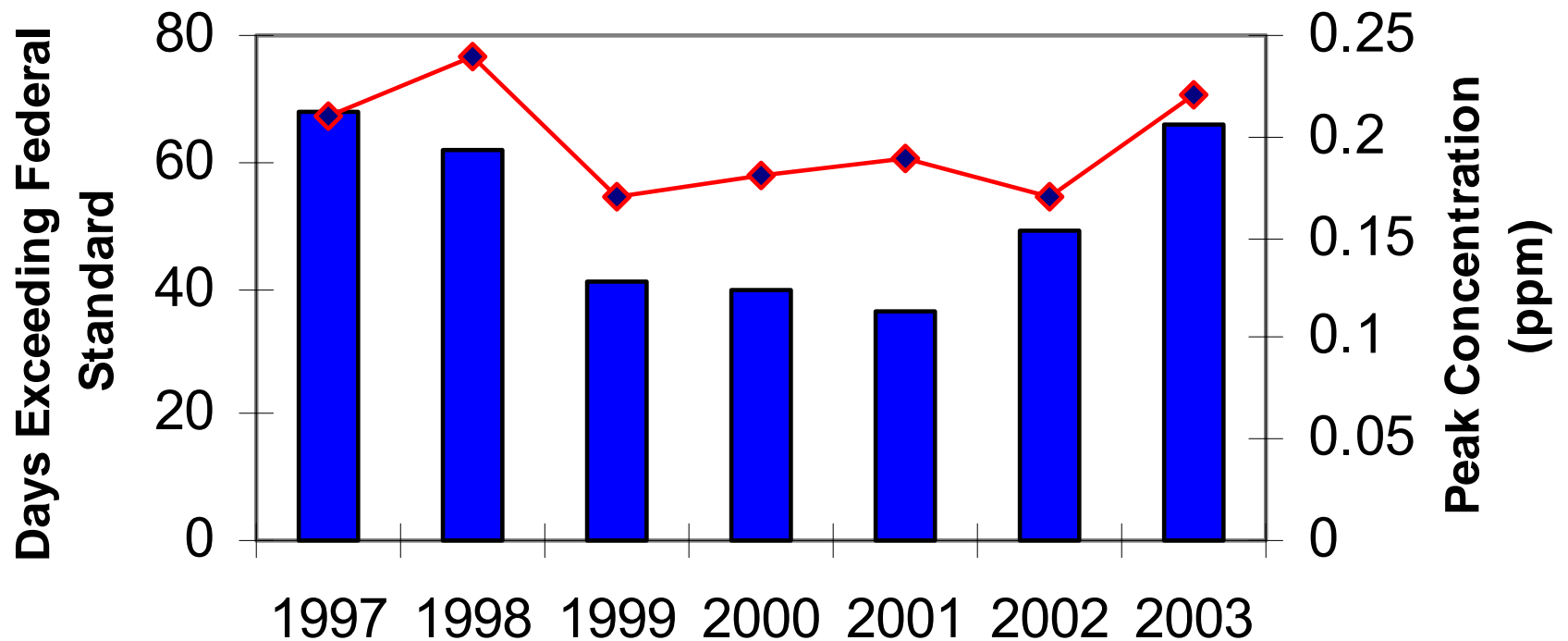
Air Quality Trends and Monitoring

- Pollutants monitored
 - ozone
 - PM_{2.5} & PM₁₀
 - carbon monoxide
 - nitrogen dioxide
 - sulfur oxides (sulfates)
- Long term trend improving
- Short term ozone trend mixed
- Spatial variation significant

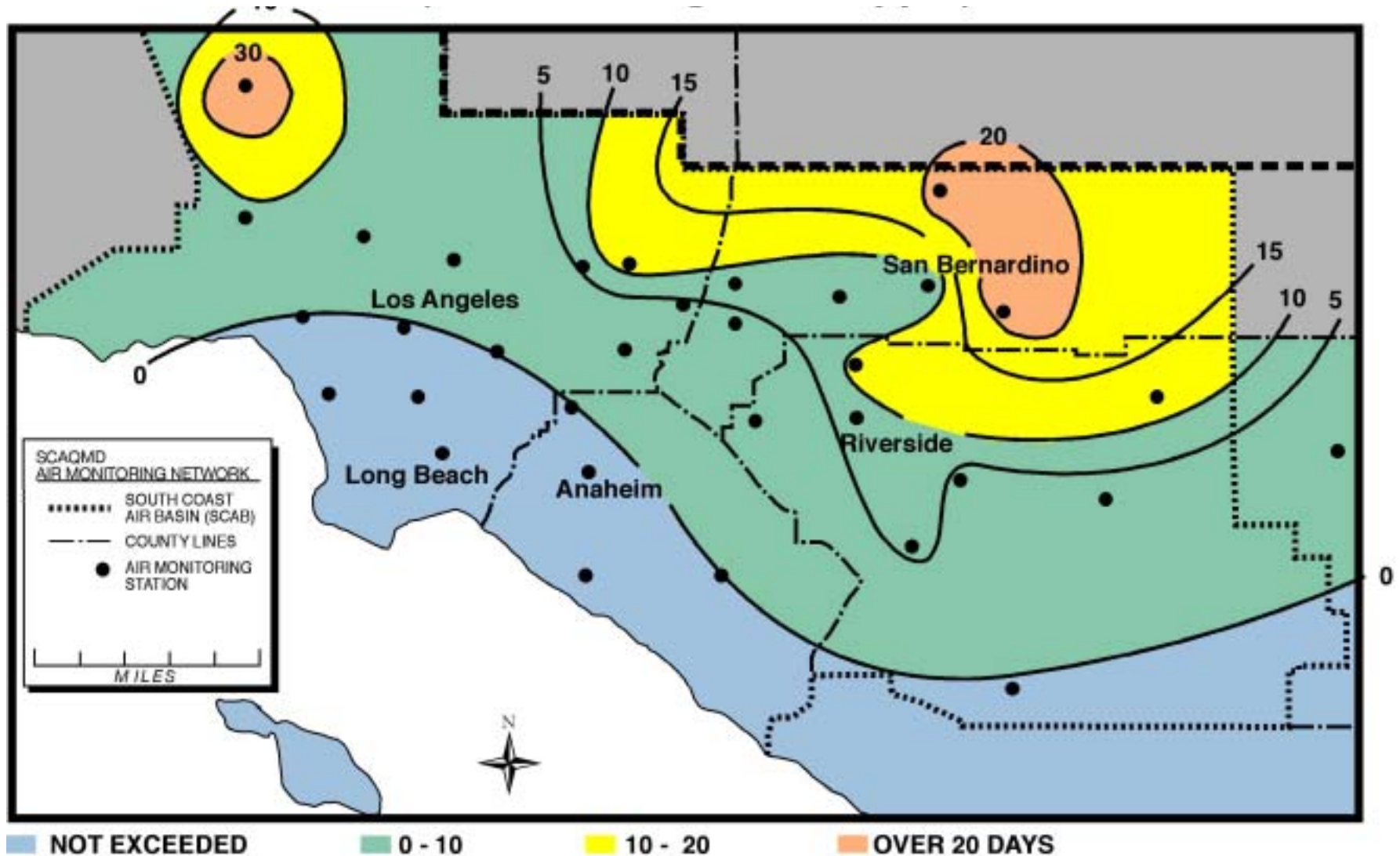
South Coast Air Basin Days Exceeding 1-Hour Federal Ozone Standard



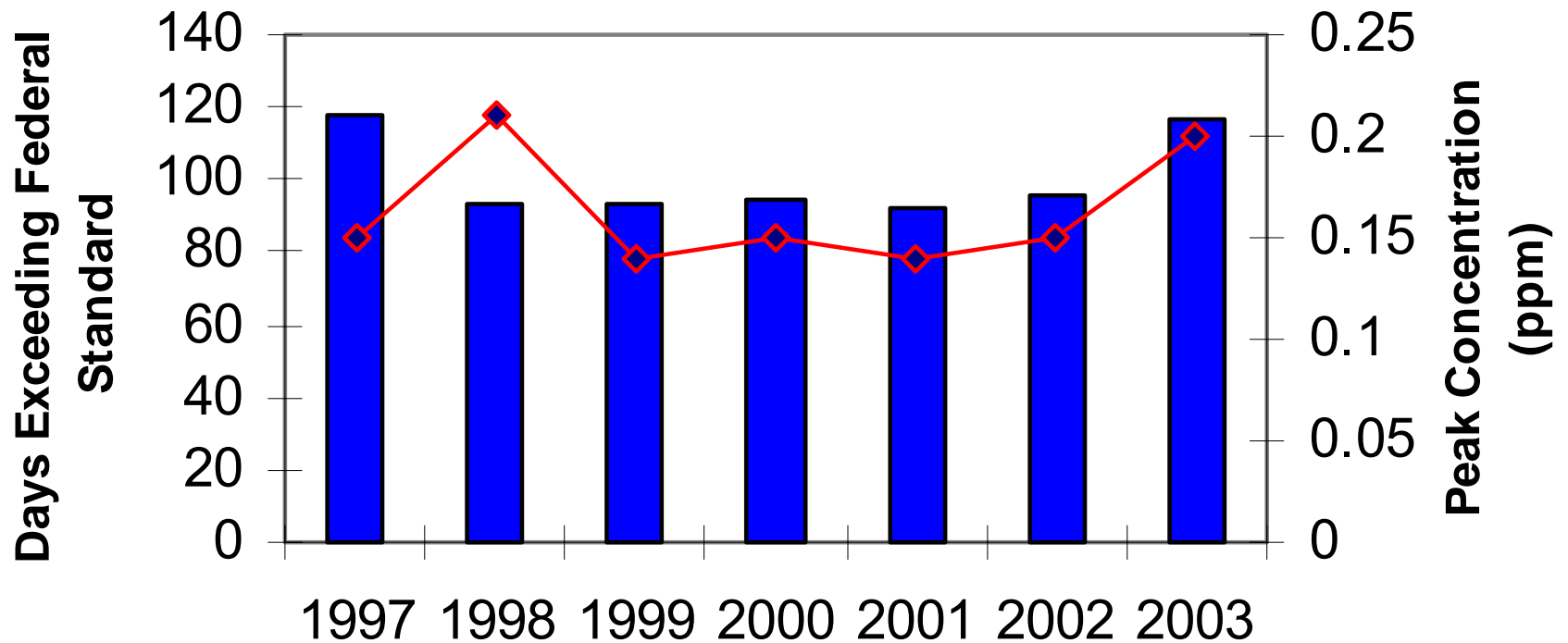
South Coast Air Basin 1-Hour Average Ozone



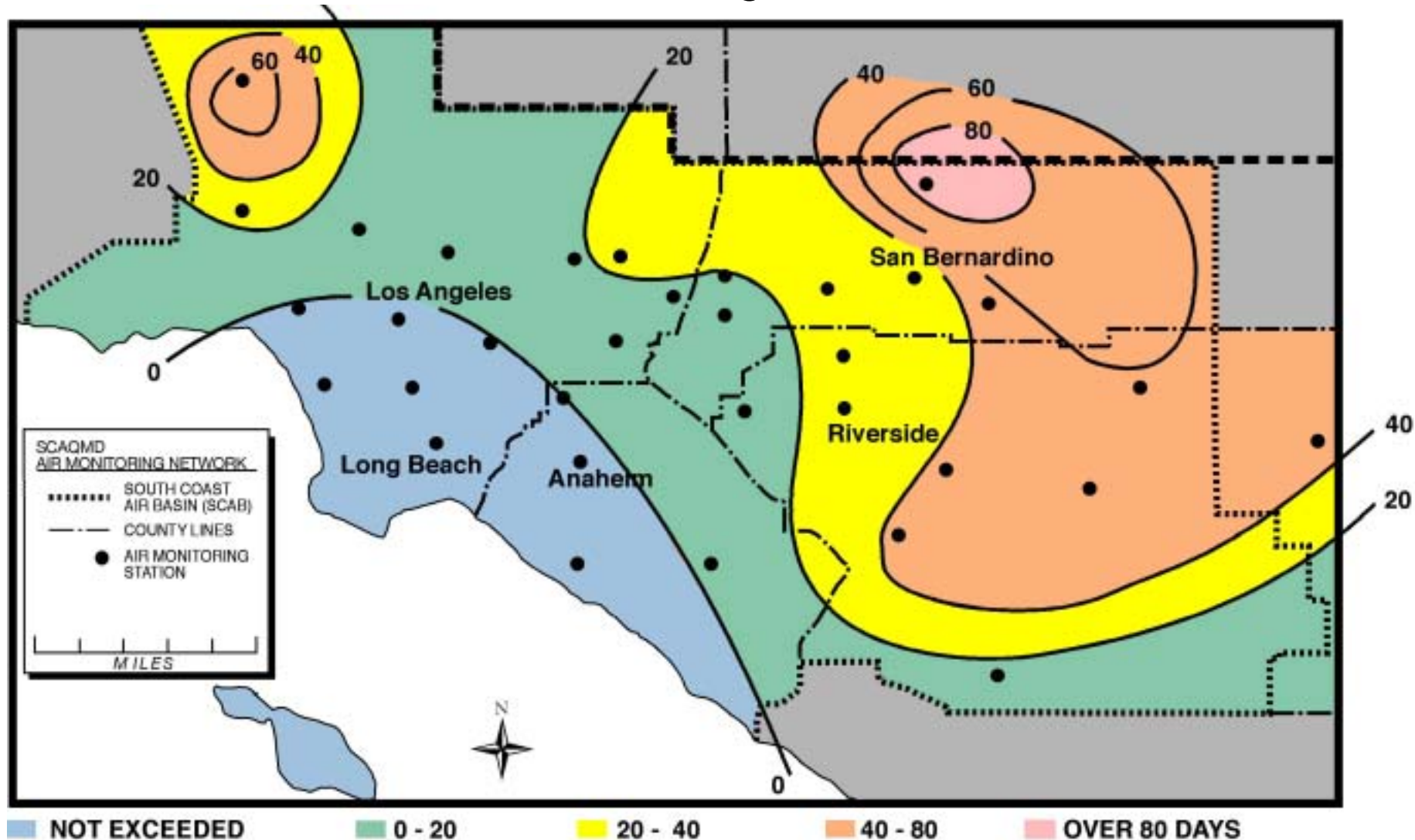
Number of Days Exceeding the Federal 1-Hr Ozone Air Quality Standard in 2002



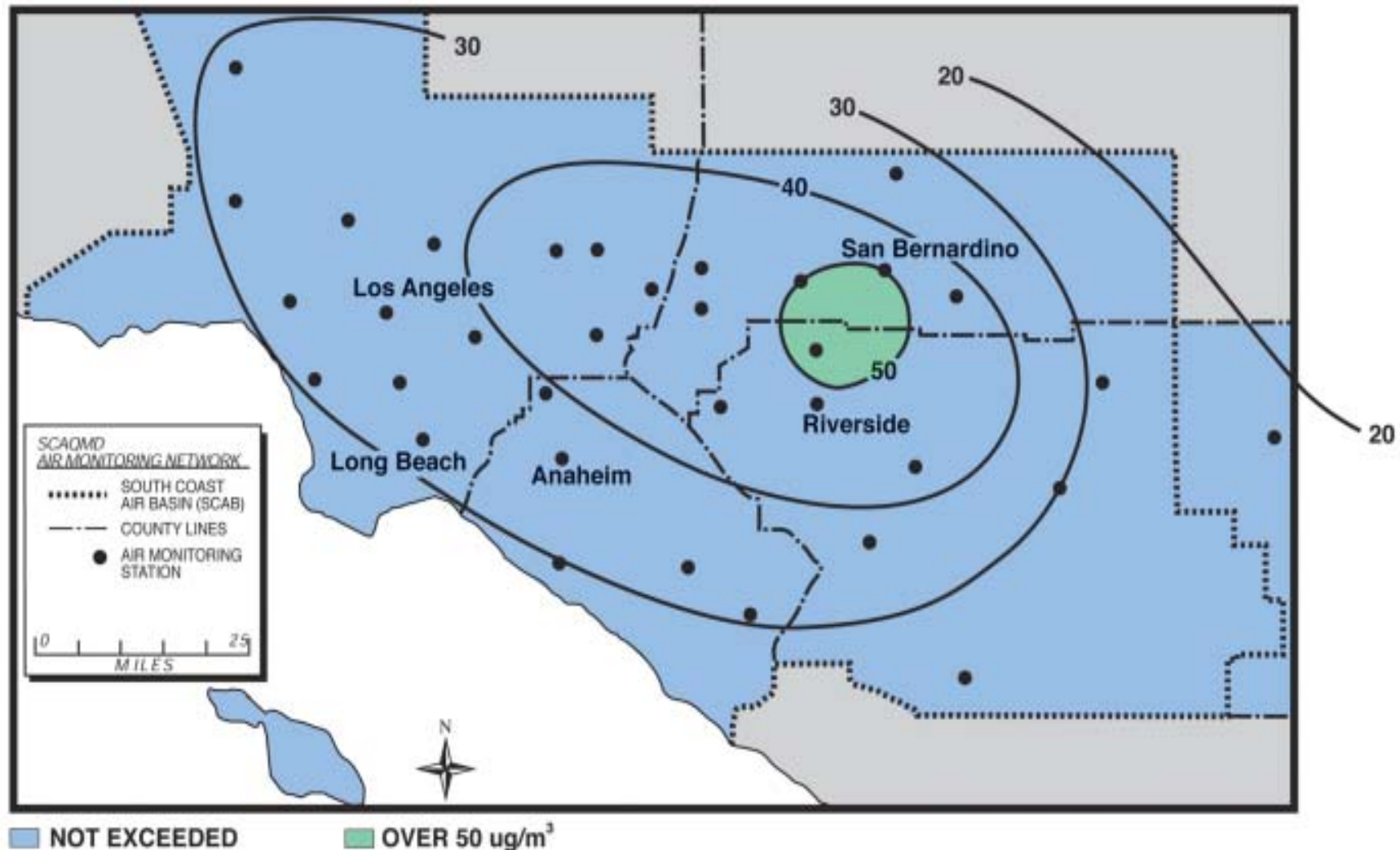
South Coast Air Basin 8-Hour Average Ozone



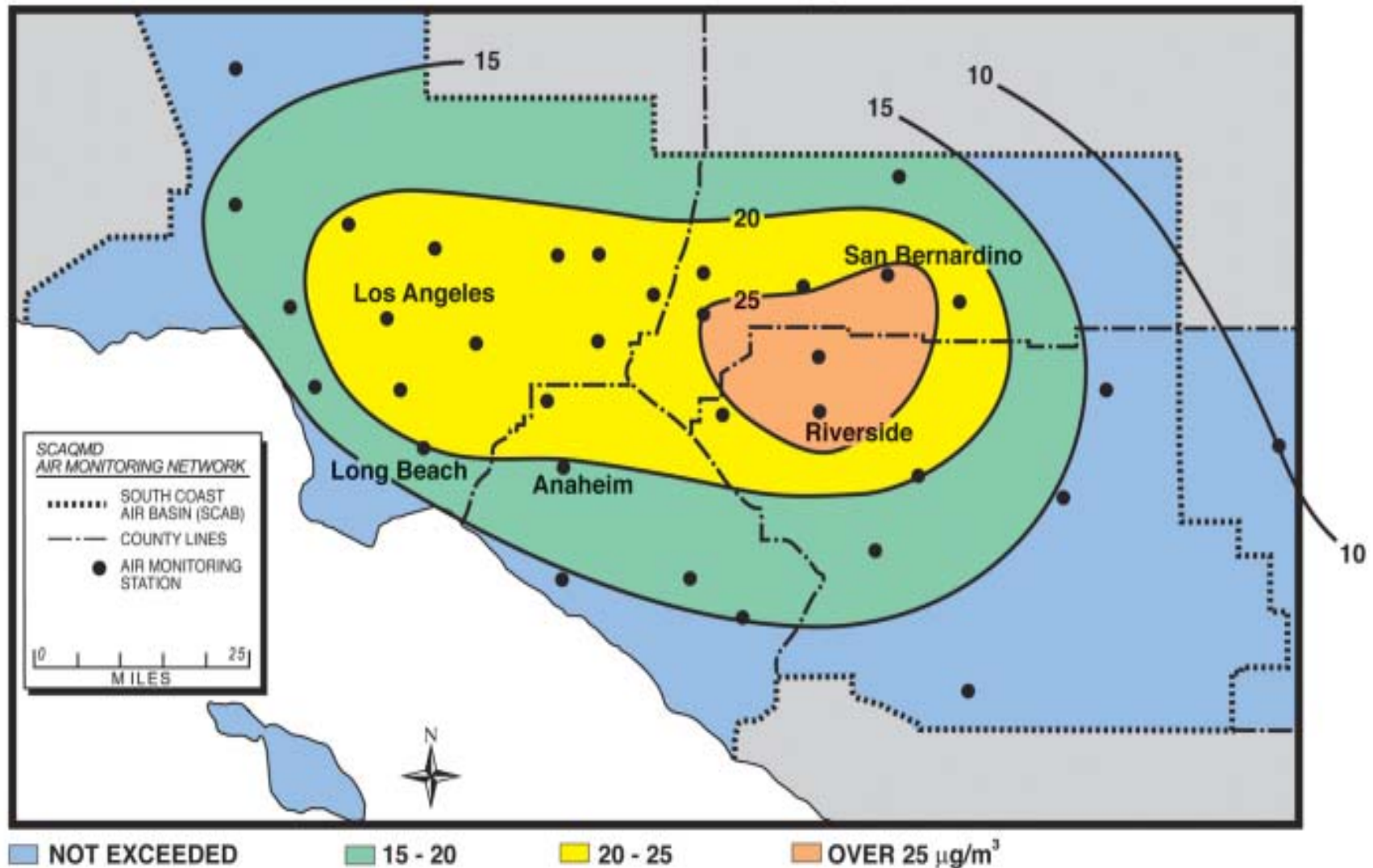
Number of Days Exceeding the Federal 8-Hr Ozone Air Quality Standard in 2002



Annual PM10 Air Quality in 2002



Annual PM_{2.5} Air Quality in 2002



Air Monitoring Stations

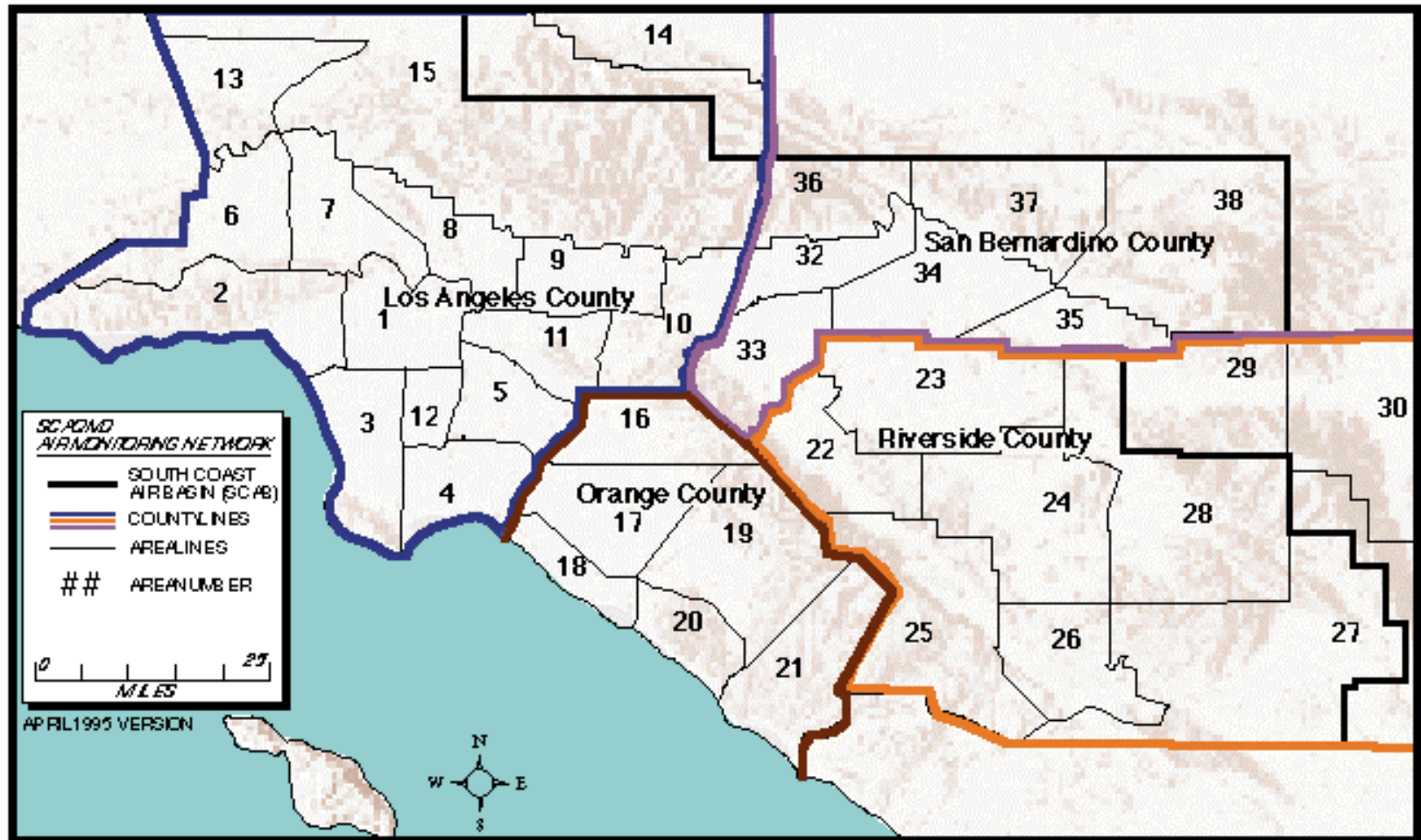


Indio



Rubidoux

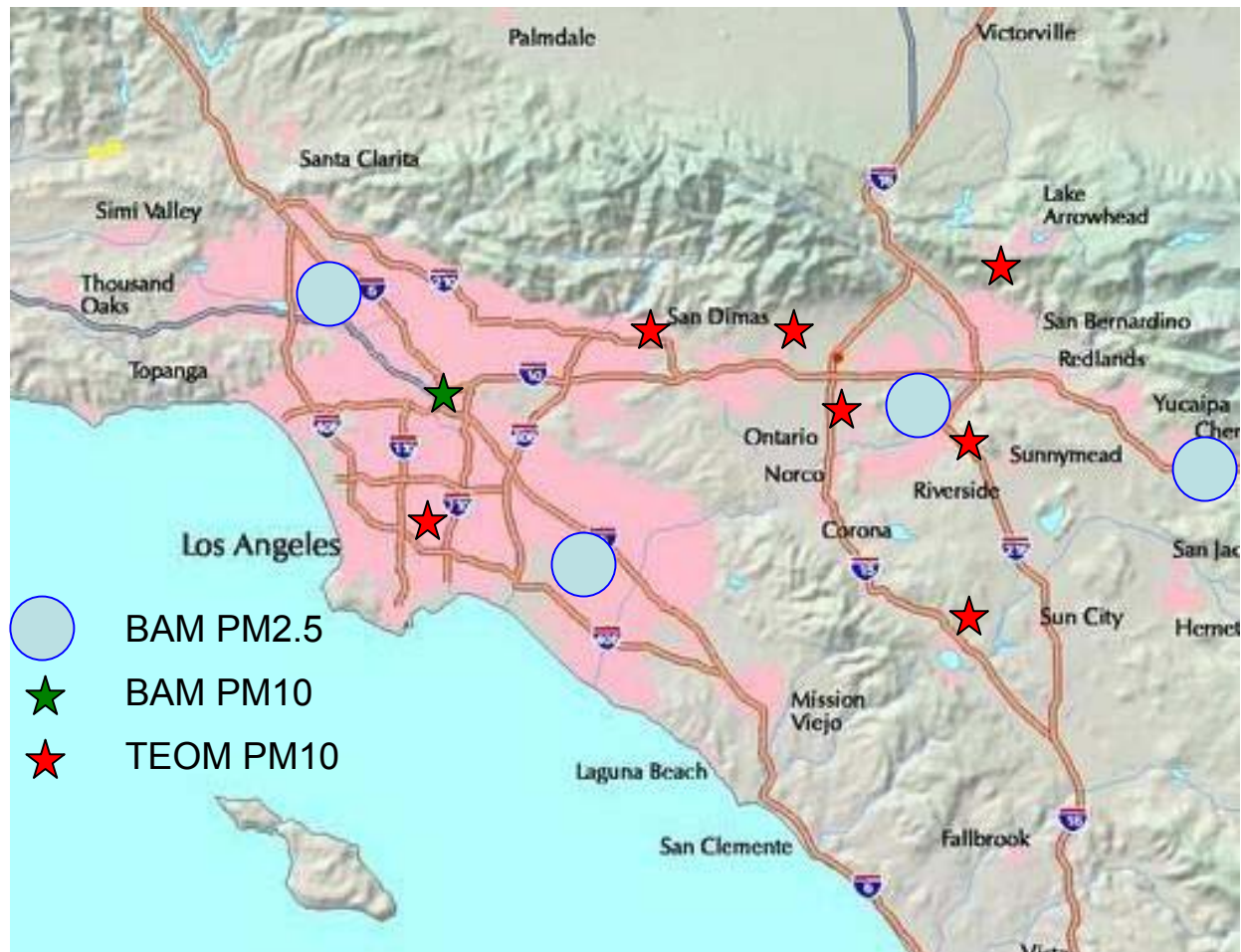
Source/Receptor Areas (SRA)



Continuous Ozone Monitoring



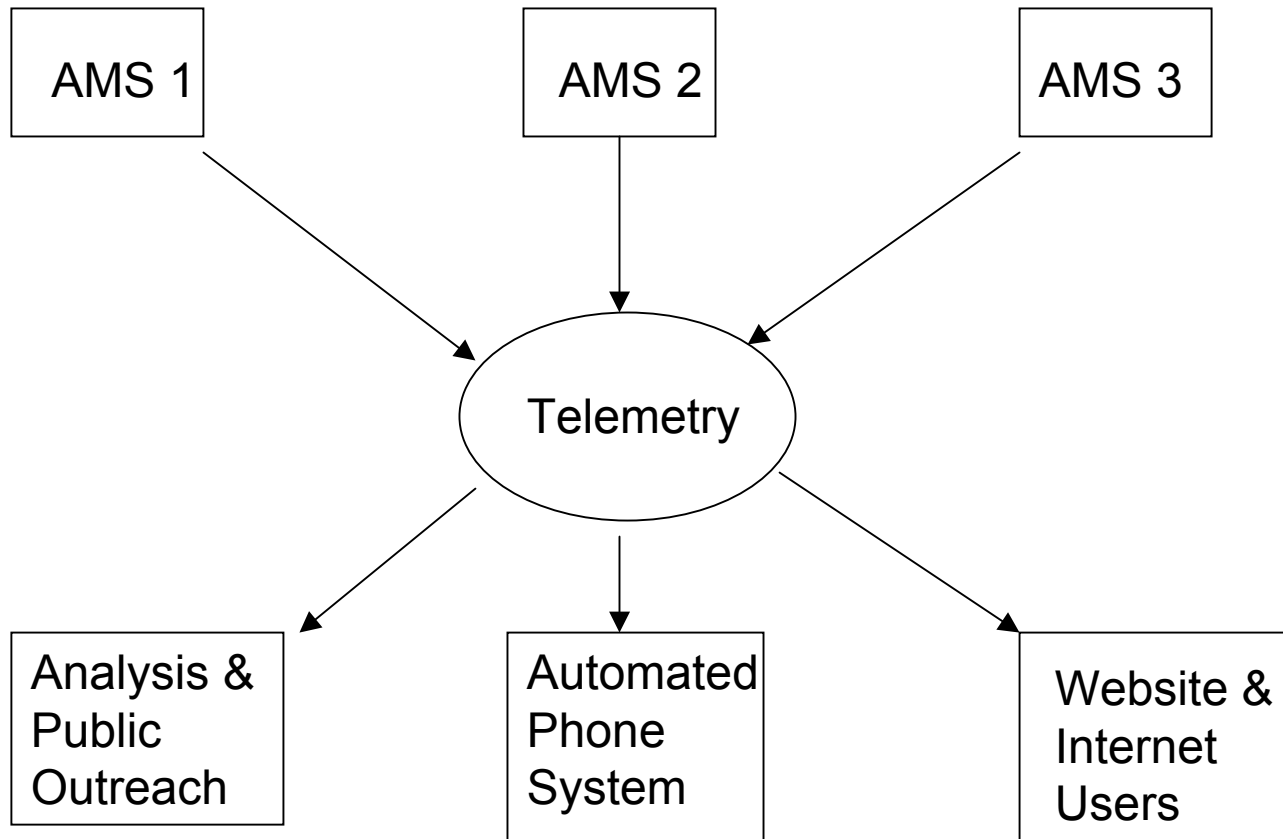
Continuous Particulate Monitoring



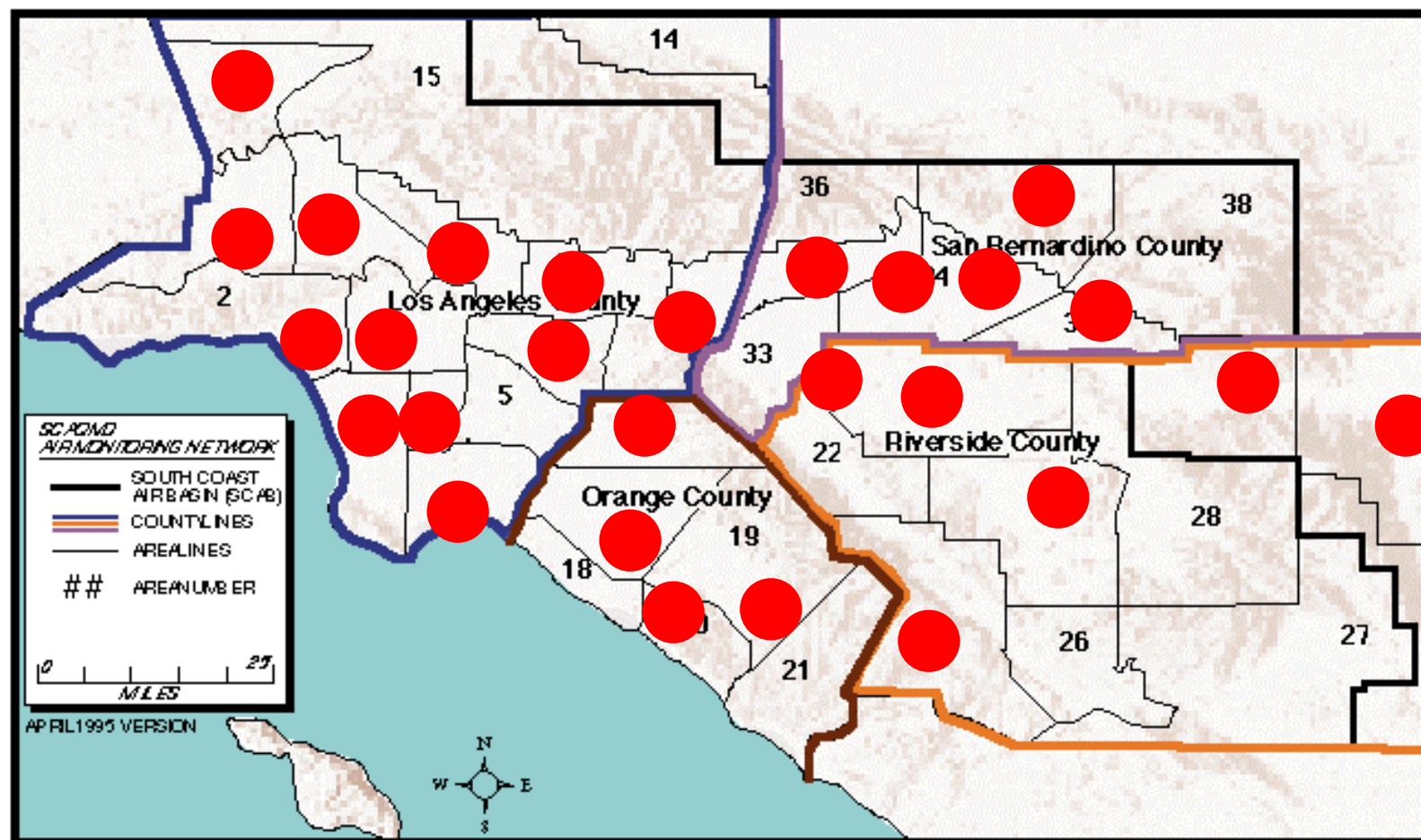
Air Quality Communications

- Website and automated telephone voice recording updated hourly from telemetry
- 24-hour operator available
 - air quality specialists
 - health effect officer
 - meteorology
- Press Office outlet to media
- Air quality forecast and same-day updates issued via e-mail, fax, website posting, AIRNOW and telemetry computer

Flow of Information

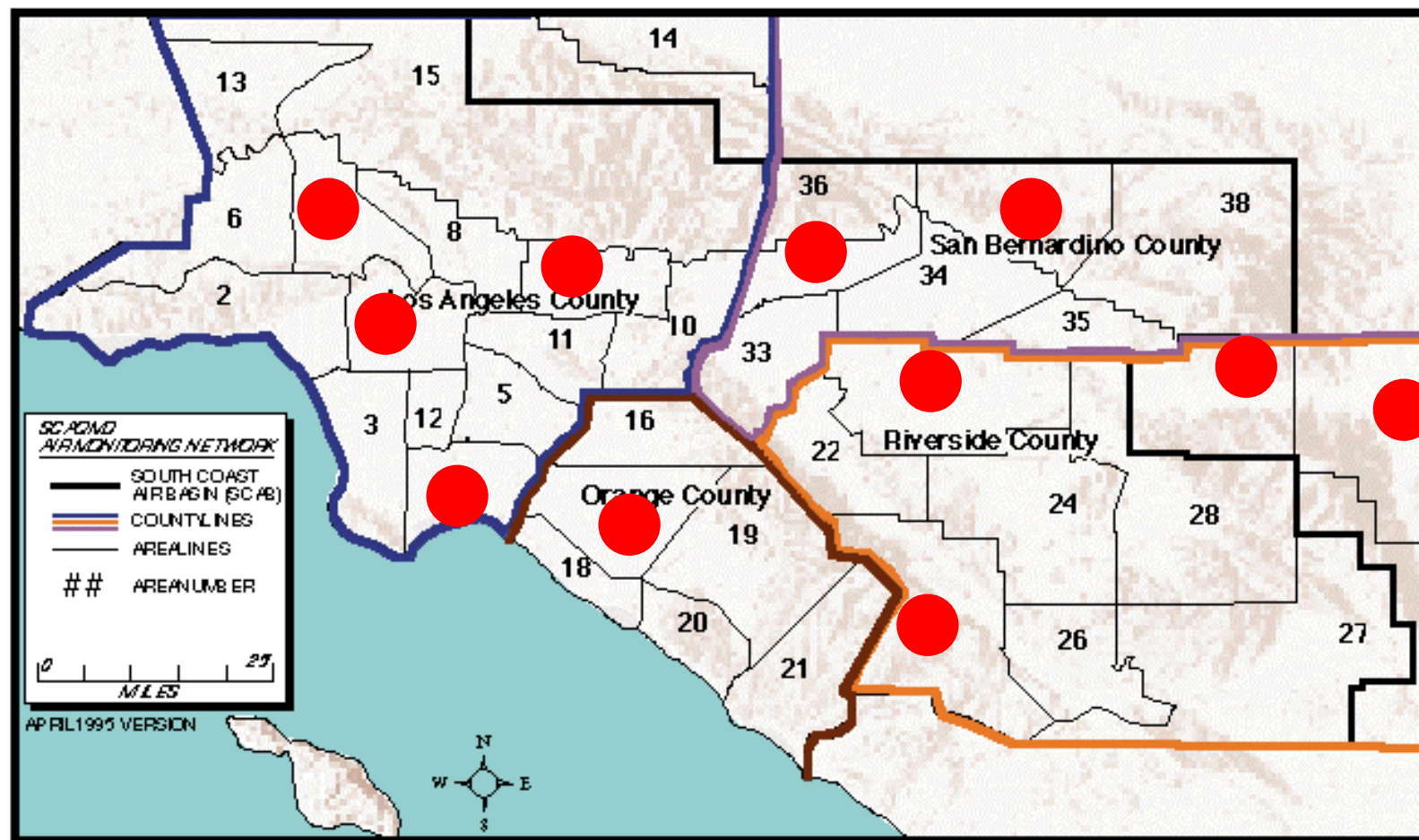


Monitoring Source-Receptor Areas



● - Continuous Ozone Monitoring Station

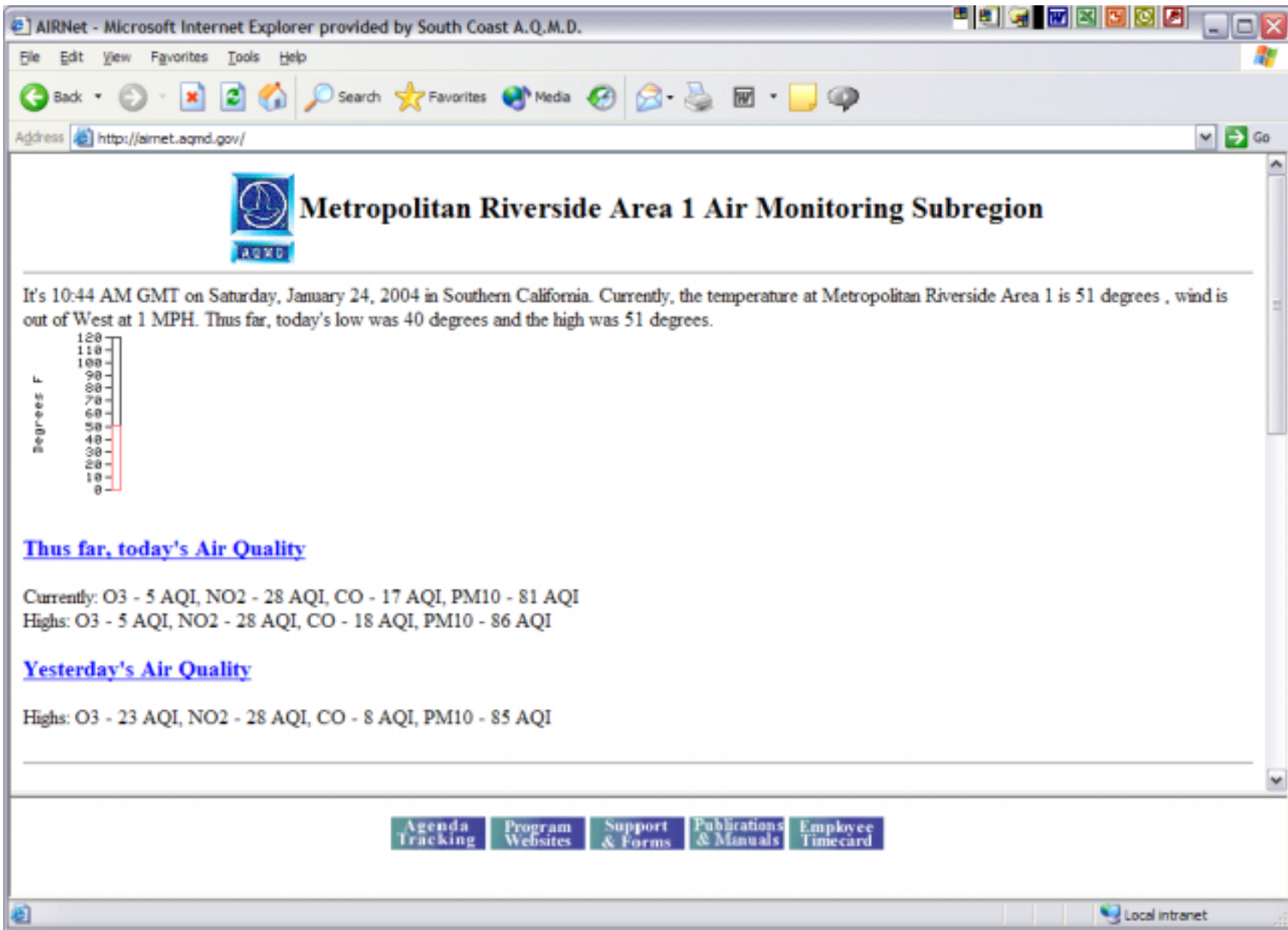
Monitoring Source-Receptor Areas



● - Particulate Continuous Monitoring Station

The Chinks in the Armor

- Automated information systems report only data monitored at that station
 - > Ozone reporting is comprehensive
 - > No mechanism to interpolate real-time PM10 or PM2.5
- Forecast and updates issued to schools, and public include ozone, PM10 & PM2.5 for all areas through the AQI
- Areas having no PM monitoring report the AQI derived from gaseous pollutants



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Address <http://airmet.aqmd.gov/>



Central San Bernardino Valley 1 Air Monitoring Subregion

It's 10:41 AM GMT on Saturday, January 24, 2004 in Southern California. Currently, the temperature at Central San Bernardino Valley 1 is 50 degrees , wind is out of North-northwest at 2 MPH. Thus far, today's low was 43 degrees and the high was 50 degrees.

Degrees F



[Thus far, today's Air Quality](#)

Currently: O3 - 5 AQI, NO2 - 38 AQI
Highs: O3 - 5 AQI, NO2 - 39 AQI

[Yesterday's Air Quality](#)

Highs: O3 - 28 AQI, NO2 - 35 AQI

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Local intranet

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East San Bernardino Valley Air Monitoring Subregion

It's 10:46 AM GMT on Saturday, January 24, 2004 in Southern California. Currently, no temperature information is available , wind is out of East-northeast at 1 MPH.

[Thus far, today's Air Quality](#)

Currently: O3 - 27 AQI
Highs: O3 - 27 AQI

[Yesterday's Air Quality](#)

Highs: O3 - 27 AQI

About the Pollutant Measurements

NOTE: The AQI graph for each station uses raw data taken directly from the District's telemetry system. Raw data are unvalidated and, therefore, subject to change.

Ozone (O3):	invisible, irritates and impairs breathing
<small>Atmospheric Oxidant (AOX):</small>	<small>Respiratory Irritant & Irritation</small>

Agenda Tracking

Program Websites

Support & Forms

Publications & Manuals

Employee Timecard

Local intranet

The Consequence

- During an episode, particularly PM, neighboring areas can have extreme differences in reported AQI
- Forecasted AQI in areas having no real-time monitoring often conflicts with the automated report
- Many schools use the automated reports to confirm the forecast and determine outdoor activity schedules
- Credibility gap opens

Forecast Messages

- Daily air quality forecast:
Next-day (30-Hr) forecast for all
source receptor area (SRA)
“Nowcast” -- same day update
- Special Smoke Statements
- PM10 Dust Advisories
- Episode declaration statements

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
DAILY AIR QUALITY FORECAST
VALID: WED., FEB. 2, 2000

SRA NUMBER	AREA	1-HR OZONE PPM	8-HR OZONE PPM	8-HR CO PPM	24-HR PM10 UG/M3	24-HR PM2.5 UG/M3	24-HR NO2 PPM	MAX AQI
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Los Angeles County: South Coast Air Basin

1	Central LA Co	.03	.02	4.5	54	37	.09	93
2	NW Coastal LA	.05	.04	6.9	53	36	.09	91
3	SW Coastal LA	.04	.03	13.1	52	36	.08	165
4	S Coastal LA	.04	.03	5.1	52	36	.07	91
5	Southeast LA Co	.04	.03	3.8	60	39	.07	97
6	W San Fernando Vly	.05	.04	4.2	44	32	.05	83
7	E San Fernando Vly	.01	.01	7.9	44	32	.10	100
8	W San Gabriel Vly	.03	.02	4.6	51	25	.06	69
9-1	E San Gabriel Vly-1	.03	.03	3.1	49	23	.04	65
9-2	E San Gabriel Vly-2	.04	.03	4.5	53	26	.05	71
10	Pomona Walnut Vly	.04	.03	3.8	58	28	.09	90
11	S San Gabriel Vly	.05	.04	11.4	38	18	.09	140
12	S Central LA Co	.04	.03	2.1	35	28	.05	75
13	Santa Clarita Vly	.05	.04	2.1	35	17	.02	53
15	San Gabriel Mts	.04	.03	3.0	49	23	.06	65

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
SMOG EPISODE NOTIFICATION
FRIDAY, APRIL 23, 2004**

Today's Air Quality: Valid Friday, April 23, 2004

Today, April 23, 2004, air quality is expected to be GOOD to MODERATE in most areas, but air pollution levels will exceed the Federal Clean Air Standard of 100 on the Air Quality Index (AQI) in the following areas:

Area #	Monitoring Area	Description	Pollutant	AQI	Time
23	Metropolitan Riverside	Unhealthy-Sensitive	Ozone	113	2 to 5 p.m.
34	Central San Bernardino Vly.	Unhealthy-Sensitive	Ozone	125	2 to 5 p.m.
35	East San Bernardino Valley	Health Advisory	Ozone	175	2 to 5 p.m.
37	Central San Bernardino Mtns.	Unhealthy	Ozone	150	3 to 6 p.m.

Tomorrow's Forecast: Valid Tuesday, September 26, 2000

Tomorrow, September 26, air quality is predicted to be GOOD to MODERATE in most areas, but air pollution levels will exceed the Federal Clean Air Standard of 100 on the Air Quality Index (AQI) in the following areas:

Area #	Monitoring Area	Description	Pollutant	AQI	Time
34	Central San Bernardino Vly.	Unhealthy-Sensitive	Ozone	125	2 to 5 p.m.
35	East San Bernardino Valley	Unhealthy-Sensitive	Ozone	140	2 to 5 p.m.

What To Do When Air Pollution Exceeds the Federal Clean Air Standard

In areas with **UNHEALTHFUL** air quality (PSI of 101 to 137), susceptible persons, such as those with heart or lung disease, should minimize outdoor activity.

In areas with **HEALTH ADVISORY EPISODES** for ozone (PSI of 138 to 199), everyone should discontinue prolonged, vigorous outdoor exercise lasting longer than one hour. Examples of the kinds of outdoor activities that should be avoided are calisthenics, basketball, running, soccer, football, tennis, swimming laps, water polo. Susceptible persons, such as those with heart or lung disease, should avoid outdoor activity entirely.

In areas having **STAGE I EPISODES** (PSI of 200 or above), everyone should discontinue all vigorous outdoor activities regardless of duration.

Typical Media Forecast

AIR QUALITY FORECAST*

ON TUE., MAY. 4, 1999 THE SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT PREDICTS THE AIR QUALITY WILL BE ...

GOOD IN THE:

COASTAL AREA,	PSI:	42	OZONE
METROPOLITAN AREA,	PSI:	50	OZONE
INLAND ORANGE COUNTY AREAS,	PSI:	50	OZONE
BIG BEAR LAKE AREAS,	PSI:	50	OZONE

MODERATE IN THE:

SAN FERNANDO/SANTA CLARA VALLEYS,	PSI:	58	OZONE
SAN GABRIEL/POMONA VALLEYS,	PSI:	67	OZONE
RIVERSIDE/SAN BERNARDINO AREAS,	PSI:	67	OZONE
HEMET/ELSINORE AREAS,	PSI:	58	OZONE
HIGH DESERT,	PSI:	67	OZONE
LOW DESERT,	PSI:	84	PM10
BANNING AREA,	PSI:	58	OZONE

General Dissemination

- District is responsible to notify school district headquarters (forecast & episode notification)
- Message is retransmitted by school through telephone and FAX tree
- Some schools elect to telephone in or view the website
- Outreach to private and parochial schools needs improvement

Communications Effectiveness

Method	Reliability	Verification	Resources
FAX	High	Yes	FAX & Paper
E-Mail	High	Limited	Internet & Computer
IVR	High	None	Telephone
Website AQMD & AirNow	High	None	Internet & Computer
Media	High	None	None

Operational Considerations

- Maintain an active contact lists
- Number of calls and e-mails increase during episodes and emergencies
- District contracts for FAX service
- E-mail – no additional resources at this time
- Some complaints from schools about paper usage
- Some confusion within school districts whom to notify
- Some school districts want multiple messages

Acceptance

- School participation high
- Timing and planning requires early notification
- After school activities most impacted by air quality and least accessible to episode notification
- Turn-over in responsible school officials is an obstacle to communications

Communications Under Fire: Oct. 2003

- Phone calls by the hundreds per hour
- Angry school administrators and coaches
 - > cancel “home coming” football games
 - > grumpy teachers (kids confined indoors)
 - > parents complaining kids were let outdoors because schools relied on automated information sources
- AIRNOW PM2.5 readings not operational

The Grinch that Stole Home Coming



Translating Smoke Impacts Through the Health Message

- Health Message:
 - > Avoid outdoor activities
 - cancel outdoor school recess
 - postpone after school sports
 - wear particulate mask
 - > Stay indoors turn on air conditioner
- Common sense approach:
If you can smell the smoke and the visibility is reduced use caution

Going With the Flow

- TV, radio, newspapers helped deliver the health message
- Maintained extra communications staffing throughout the weekend and following week
- To address the conflict between PM reporting and non reporting areas issued statement as part of forecast to “*disregard the automated systems until further notice*”

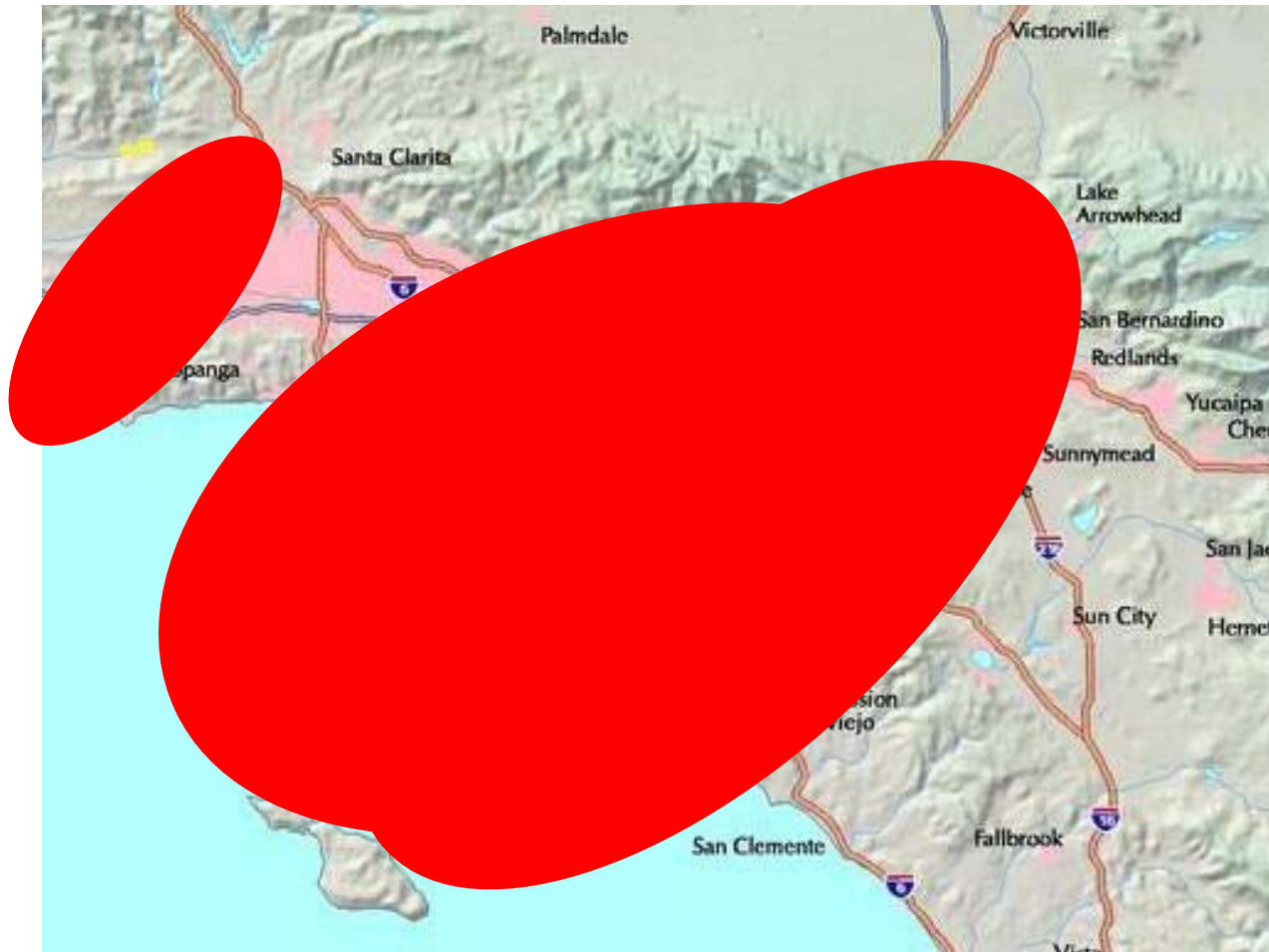
Smoke and AQI

- AQI is more responsive to PM_{2.5}
- 3 - PM_{2.5} sites operated during the fire
- Data from 11- PM₁₀ sites were available
- Average Basin ratio of PM_{2.5} to PM₁₀ is approximately 0.65 (probably higher for smoke from wildfires)
- Used the ratio to estimate PM_{2.5} at PM₁₀ sites and calculated the AQI
- Estimated AQI was communicated to the public, media and supported the forecast

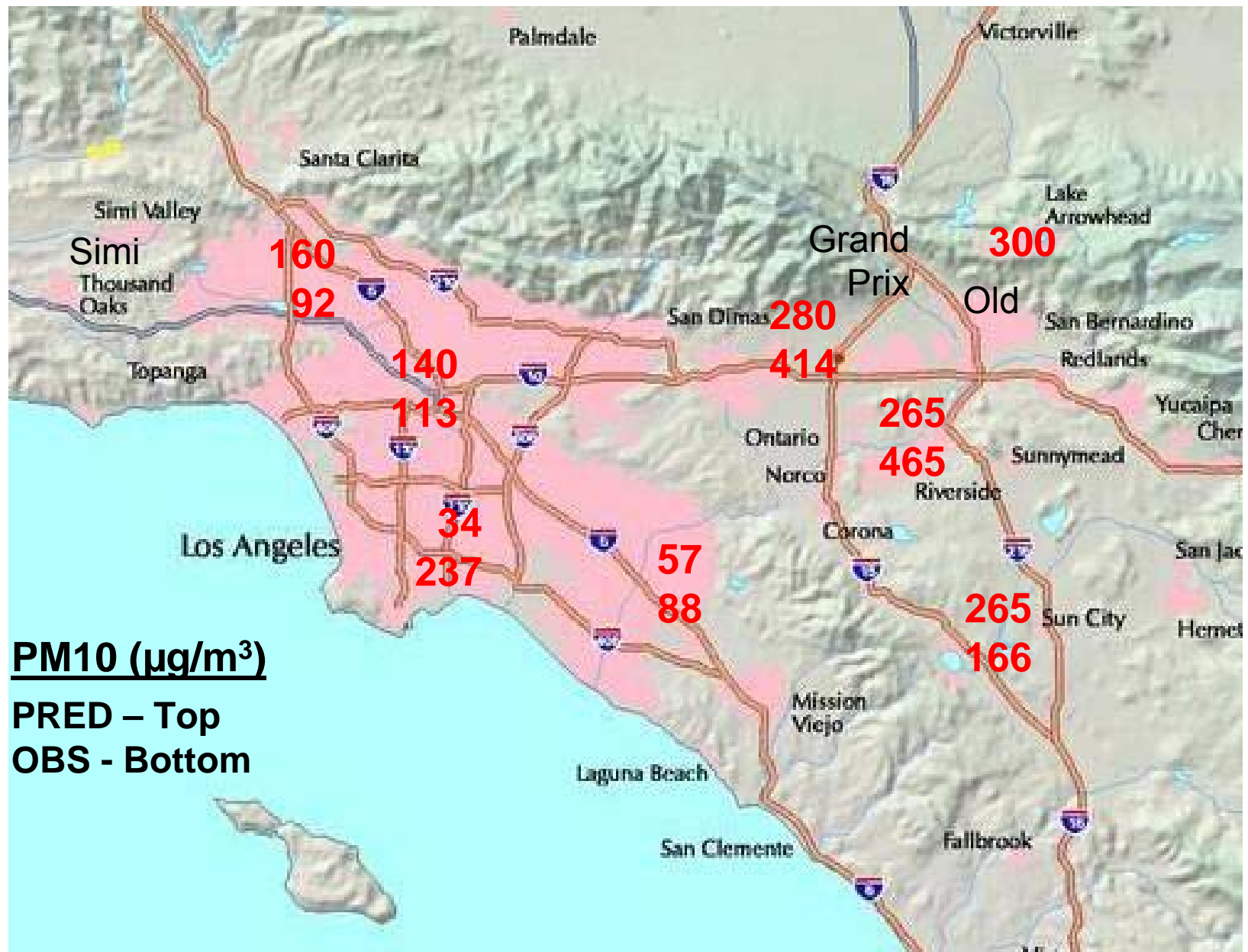
October 26-27, 2003



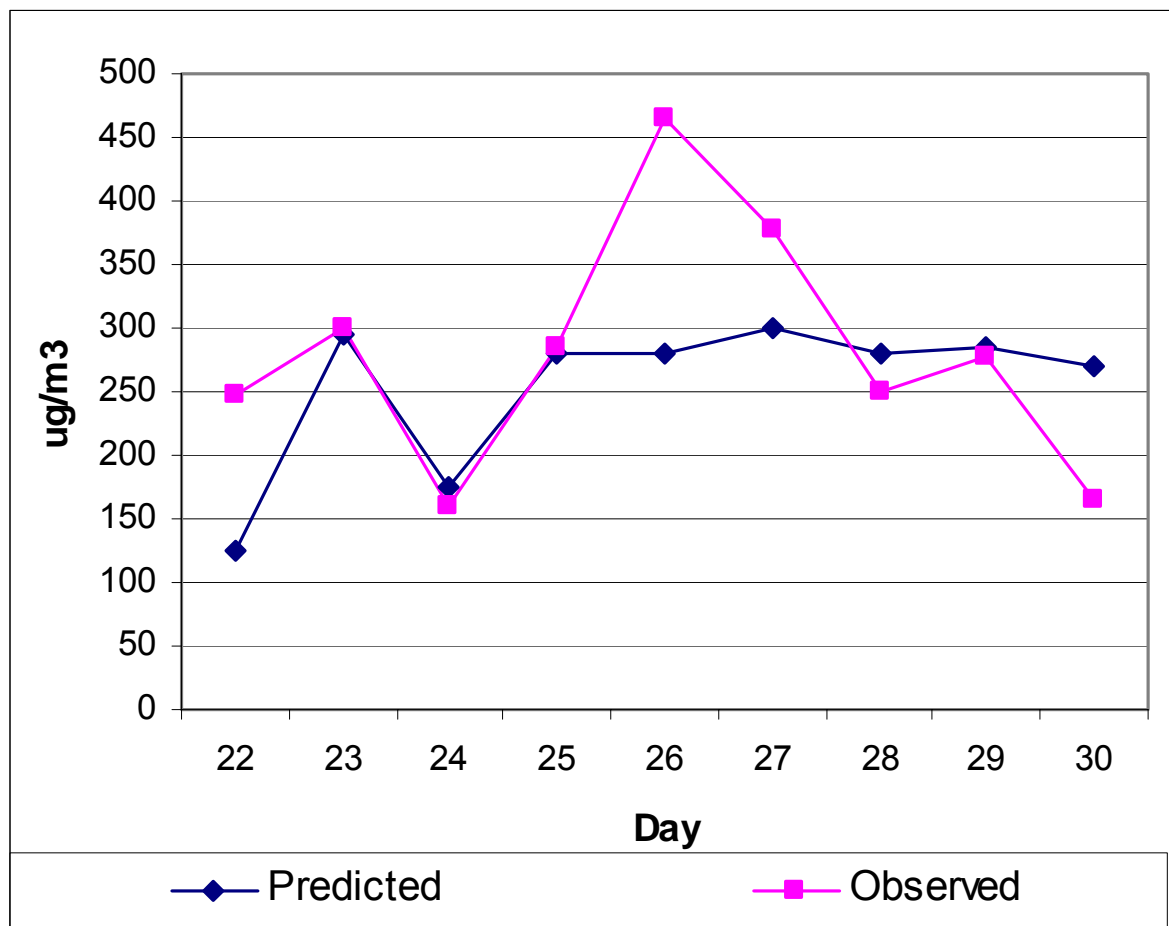
Primary Smoke Impact Area October 26



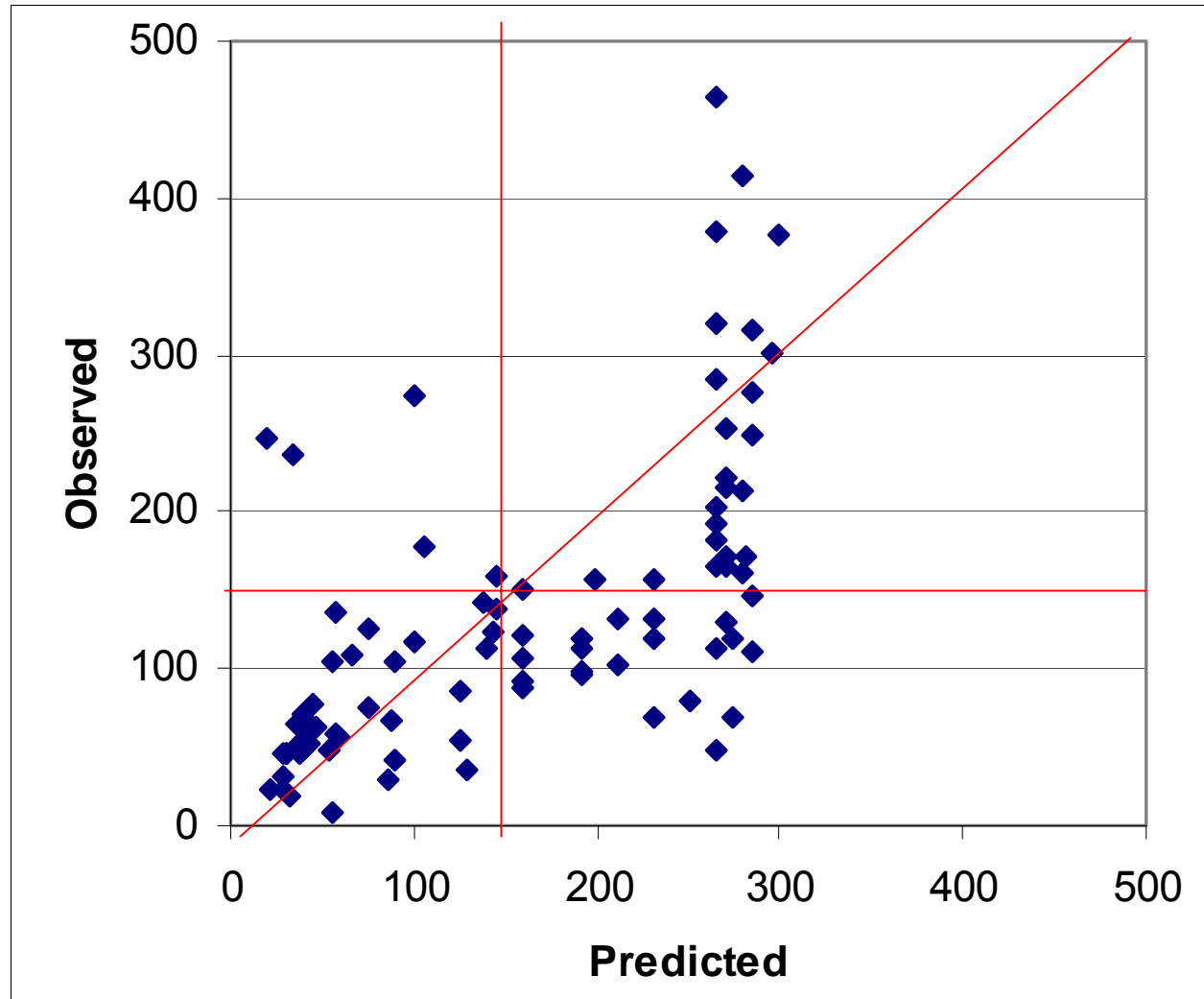
PM10 Predicted and Observed: Oct 26th



Daily Maximum Predicted and Observed 24-Hour Average PM10



PM10 24-Hour Avg. Prediction Accuracy: 11-Sites With Continuous Monitoring



PA 76%
for
Federal
Standard

Lessons Learned

- Update all emergency outreach plans and materials distributed to schools and public
 - > air pollution episodes
 - > wildfire smoke
 - > hazardous spills
- Develop expanded real time particulate monitoring
- Investigate use of airport ASOS visibility as surrogate of fine particulate for AQI reporting

Observations

- “Spare the Air Programs” warn the public and initiate emissions mitigation actions
- One size does not fit all
 - different initiation thresholds
 - costs/frequency of events
- Avoid the “cry wolf syndrome”
- Reevaluate the ozone health advisory
- Evaluate the potential need for a PM_{2.5} health advisory episode (possibly at shorter averaging times)

Summary

- District's communications system with schools works despite some warts
- Websites, e-mail and possibly cell phones have great potential for expanded use
- Continued need for aggressive outreach
 - school conferences
 - provide localized air quality profiles
 - assist schools to update internal air quality emergency procedures
- Extend and improve outreach and communications for after-school activities